

Search Plan and Results

Question

What is the relationship between consumption of plant n-3 fatty acids and risk of cardiovascular disease? (DGAC 2010)

What is the relationship between consumption of seafood n-3 fatty acids and risk of cardiovascular disease? (DGAC 2010)

Date Searched

8/21/09

Inclusion Criteria

Subjects/Population

Age: Adults (19 years +)

Setting: Any, except ICU, Burn Unit or Emergency Care, US and International

Health Status:

- Healthy
- Dyslipidemia, Hyperlipidemia* or Hypercholesterolemia, CHD, CVD

*According to ATP III (2004), hyperlipidemia is defined as a TC greater than 200 and/or LDL-C greater than 130 without CVD; LDL-C greater than 100 with CVD; and LDL-C greater than 70 for patients with a CHD event, stroke, TIA, peripheral vascular disease AND ONE OF THE FOLLOWING:1) acute coronary syndrome, 2) type 2 diabetes mellitus, 3) metabolic syndrome, 4) a SINGLE POORLY CONTROLLED risk factor, 5) 3 risk factors irrespective of how well controlled.

Note: in ATP III, diabetes is regarded as a CHD risk equivalent.

Nutrition Related Problem/Condition:

Cardiac Events: MI, arrhythmia, angioplasty, stent, death

Study design preferences:

- Meta-analysis and Systematic reviews
- RCT or Clinical Controlled Studies
- Large nonrandomized observational studies
- Prospective Cohort, large case-control studies
- Cross Sectional Studies (last resort)

Feeding period must be greater than 4 weeks.

Size of study groups:

- Sample size must equal 10 subjects for each study group. For example, this would include 10 subjects in the intervention group and 10 subjects in the control or comparison group.

Study dropout rate: Less than 20%; preference for smaller dropout rates

Year Range: March 2004 –Dec 2007 (covered by ADA) July 2007 to Aug 2009 (covered by USDA)

Authorship:

- If an author is included on more than one Review Article or primary research article that is similar in content, the most recent review or article will be accepted and earlier versions will be rejected.
- If an author is included on more than one Review Article or primary research article and the content is different, then both reviews may be accepted.

Languages: Limited to articles in English

Other: Article must be published in peer-reviewed journal

Exclusion Criteria

Subjects/Population

Age: Infants, Children and adolescents <19 years

Setting: ICU, Burn Unit, Emergency Care

Health Status:

- Presence of diabetes
- TC less than or equal to 200 and/or LDL-C less than or equal to 130. Also, see inclusion criteria

Nutrition Related Problem/Condition: (i.e., eating disorders)

Cardiac Events: stroke, triglyceride, lipids, inflammatory markers

Size of study groups: Sample sizes < 10

Study Designs:

- Small case studies
- Cross sectional Studies
- Feeding periods
- Experimental fat must be from natural sources

Study Dropout rate: Dropout rate in a study is 20% or greater

Year Range: Prior to July 2007 included in ADA analysis

Authorship: Studies by same author similar in content

Languages: Articles not in English

Other: Animal studies; Abstracts or presentations

Search Terms: Search Vocabulary

(arrhythmia* OR "Arrhythmias, Cardiac"[Mesh] OR "Arrhythmia, Sinus"[Mesh]) AND ("Fatty Acids, Omega-3"[Mesh] OR "Docosahexaenoic Acids"[mh] OR "alpha-Linolenic Acid"[Mesh] OR "SR 3 linolenic acid "[Substance Name] OR "8, 11, 14-Eicosatrienoic Acid"[Mesh] OR "Fish Oils"[Mesh] OR "Plant Oils")

("Fatty Acids, Omega-3"[Mesh] OR "Fish Oils"[Mesh] OR "alpha-Linolenic Acid"[Mesh] OR "SR 3 linolenic acid "[Substance Name] OR "8, 11, 14-Eicosatrienoic Acid"[Mesh]) AND ("Death,

Sudden, Cardiac"[Mesh OR "Biological Markers"[Mesh] OR "Coronary Disease"[Mesh] OR "Myocardial Infarction"[Mesh] OR "Cardiovascular Diseases"[Mesh])

("Fatty Acids, Omega-3"[Mesh] OR "Docosahexaenoic Acids" "alpha-Linolenic Acid"[Mesh] OR "SR 3 linolenic acid "[Substance Name] OR "8, 11, 14-Eicosatrienoic Acid"[Mesh]) AND ("Fish Oils"[Mesh] OR "Plant Oils") AND ("Biological Markers"[Mesh] OR "Coronary Disease"[Mesh] OR "Myocardial Infarction"[Mesh] OR "Cardiovascular Diseases"[Mesh:NoExp] OR "blood pressure"[mh] OR hypertension[mh])

Electronic Databases

Total hits from all electronic database searches: 371

Total articles identified to review from electronic databases: 60

Articles Identified Via Handsearch or Other Means

Summary of Articles Identified to Review

Number of Primary Articles Identified: 21

Number of Review Articles Identified: 4

Total Number of Articles Identified: 22

Number of Articles Reviewed but Excluded: 32

List of Articles Included for Evidence Analysis

Seafood n-3 fatty acid question:

What is the relationship between consumption of Seafood n-3 fatty acids and risk of cardiovascular disease?

He K, Song Y, Daviglus ML, Liu K, Van Horn L, Dyer AR, Greenland P. [Accumulated evidence on fish consumption and coronary heart disease mortality: a meta-analysis of cohort studies.](#) Circulation. 2004 Jun 8;109(22):2705-11. PubMed PMID: 15184295.

König A, Bouzan C, Cohen JT, Connor WE, Kris-Etherton PM, Gray GM, Lawrence RS, Savitz DA, Teutsch SM. [A quantitative analysis of fish consumption and coronary heart disease mortality.](#) Am J Prev Med. 2005 Nov;29(4):335-46. PMID: 16242600

Mozaffarian D. [Fish and n-3 fatty acids for the prevention of fatal coronary heart disease and sudden cardiac death.](#) Am J Clin Nutr. 2008 Jun;87(6):1991S-6S. PMID: 18541600

Mozaffarian D, Rimm EB. [Fish intake, contaminants, and human health: evaluating the risks and the benefits.](#) JAMA. 2006 Oct 18;296(15):1885-99. Review. Erratum in: JAMA. 2007 Feb 14;297(6):590. PMID: 17047219

Wang C, Harris WS, Chung M, Lichtenstein AH, Balk EM, Kupelnick B, Jordan HS, Lau J. [n-3 Fatty acids from fish or fish-oil supplements, but not alpha-linolenic acid, benefit cardiovascular disease outcomes in primary- and secondary-prevention studies: a systematic review.](#) Am J Clin Nutr. 2006 Jul;84(1):5-17. PMID: 16825676.

Whelton SP, He J, Whelton PK, Muntner P. [Meta-analysis of observational studies on fish intake and coronary heart disease.](#) Am J Cardiol. 2004 May 1;93(9):1119-23. PMID: 15110203

Lindqvist HM, Langkilde AM, Undeland I, Sandberg AS. [Herring \(Clupea harengus\) intake influences lipoproteins but not inflammatory and oxidation markers in overweight men.](#) Br J Nutr. 2009 Feb;101(3):383-90. Epub 2008 Jul 18. PMID: 18634706

Lankinen M, Schwab U, Erkkilä A, Seppänen-Laakso T, Hannila ML, Mussalo H, Lehto S, Uusitupa M, Gylling H, Oresic M. [Fatty fish intake decreases lipids related to inflammation and insulin signaling--a lipidomics approach.](#) PLoS One. 2009;4(4):e5258. Epub 2009 Apr 23. PMID: 19390588

Lara JJ, Economou M, Wallace AM, Rumley A, Lowe G, Slater C, Caslake M, Sattar N, Lean ME. [Benefits of salmon eating on traditional and novel vascular risk factors in young, non-obese healthy subjects.](#) Atherosclerosis. 2007 Jul;193(1):213-21. Epub 2006 Oct 27. PMID: 17069820

Sierstad SL, Seljeflot I, Johansen O, Hansen R, Haugen M, Rosenlund G, Frøyland L, Arnesen H. [Dietary intake of differently fed salmon: the influence on markers of human atherosclerosis.](#) Eur J Clin Invest. 2005 Jan;35(1):52-9. PMID: 15638820

Albert CM, Campos H, Stampfer MJ, Ridker PM, Manson JE, Willett WC, Ma J. [Blood levels of long-chain n-3 fatty acids and the risk of sudden death.](#) N Engl J Med. 2002; 346 (15): 1, 113-1, 118.

Brouwer IA, Heeringa J, Geleijnse JM, Zock PL, Witteman JC. [Intake of very long-chain n-3 fatty acids from fish and incidence of atrial fibrillation. The Rotterdam Study.](#) Am Heart J. 2006 Apr;151(4):857-62. PMID: 16569549 (ADA)

Folsom AR, Demissie Z. [Fish intake, marine omega-3 fatty acids, and mortality in a cohort of postmenopausal women.](#) Am J Epidemiol. 2004 Nov 15;160(10):1005-10. PMID: 15522857 (ADA)

Frost L, Vestergaard P. [n-3 Fatty acids consumed from fish and risk of atrial fibrillation or flutter: the Danish Diet, Cancer, and Health Study.](#) Am J Clin Nutr. 2005 Jan;81(1):50-4. PMID: 15640459 (ADA)

Iso H, Kobayashi M, Ishihara J, Sasaki S, Okada K, Kita Y, Kokubo Y, Tsugane S; JPHC Study Group. [Intake of fish and n3 fatty acids and risk of coronary heart disease among Japanese: the Japan Public Health Center-Based \(JPHC\) Study Cohort I.](#) Circulation. 2006 Jan 17;113(2):195-202. Epub 2006 Jan 9. PMID: 16401768 (ADA)

Järvinen R, Knekt P, Rissanen H, Reunanen A. [Intake of fish and long-chain n-3 fatty acids and the risk of coronary heart mortality in men and women.](#) Br J Nutr. 2006 Apr;95(4):824-9. PMID: 16571163 (ADA).

Mozaffarian D, Ascherio A, Hu FB, Stampfer MJ, Willett WC, Siscovick DS, Rimm EB. [Interplay between different polyunsaturated fatty acids and risk of coronary heart disease in men.](#) Circulation. 2005 Jan 18;111(2):157-64. Epub 2005 Jan 3. PMID: 15630029 (ADA).

Mozaffarian D, Psaty BM, Rimm EB, Lemaitre RN, Burke GL, Lyles MF, Lefkowitz D, Siscovick DS. [Fish intake and risk of incident atrial fibrillation.](#) Circulation. 2004 Jul 27;110(4):368-73. Epub 2004 Jul 19. PMID: 15262826 (ADA).

Panagiotakos DB, Zeimbekis A, Boutziouka V, Economou M, Kourlaba G, Toutouzas P, Polychronopoulos E. [Long-term fish intake is associated with better lipid profile, arterial blood pressure, and blood glucose levels in elderly people from Mediterranean islands \(MEDIS epidemiological study\).](#) Med Sci Monit. 2007 Jul;13(7):CR307-12. PubMed PMID: 17599024.

Strepel MT, Ocké MC, Boshuizen HC, Kok FJ, Kromhout D. [Long-term fish consumption and n-3 fatty acid intake in relation to \(sudden\) coronary heart disease death: the Zutphen study.](#) Eur Heart J. 2008 Aug;29(16):2024-30. Epub 2008 Jul 18. PMID: 18641046.

Turunen AW, Verkasalo PK, Kiviranta H, Pukkala E, Jula A, Männistö S, Räsänen R, Marniemi J, Vartiainen T. [Mortality in a cohort with high fish consumption.](#) Int J Epidemiol. 2008 Oct;37(5):1008-17. Epub 2008 Jun 25. PubMed PMID: 18579573.

Virtanen JK, Mursu J, Voutilainen S, Tuomainen TP. [Serum long-chain n-3 polyunsaturated fatty acids and risk of hospital diagnosis of atrial fibrillation in men.](#) Circulation. 2009 Dec 8;120(23):2315-21. Epub 2009 Nov 23. PMID: 19933935

Virtanen JK, Mozaffarian D, Chiuve SE, Rimm EB. [Fish consumption and risk of major chronic disease in men.](#) Am J Clin Nutr. 2008 Dec;88(6):1618-25. PubMed PMID: 19064523; PubMed Central PMCID: PMC2613199.

Yamagishi K, Iso H, Date C, Fukui M, Wakai K, Kikuchi S, Inaba Y, Tanabe N, Tamakoshi A; Japan Collaborative Cohort Study for Evaluation of Cancer Risk Study Group. [Fish, omega-3 polyunsaturated fatty acids, and mortality from cardiovascular diseases in a nationwide community-based cohort of Japanese men and women the JACC \(Japan Collaborative Cohort Study for Evaluation of Cancer Risk\) Study.](#) J Am Coll Cardiol. 2008 Sep 16;52(12):988-96. PMID: 18786479.

Bucher HC, Hengstler P, Schindler C, Meier G. [N-3 polyunsaturated fatty acids in coronary heart disease: a meta-analysis of randomized controlled trials.](#) Am J Med. 2002 Mar;112(4):298-304. PMID: 11893369 (ADA).

Erkkila AT, Lehto S, Pyorala K, and Uusitupa MIJ. [n-3 Fatty acids and 5-y risks of death and cardiovascular disease events in patients with coronary artery disease.](#) Am J Clin Nutr 2003 July; 78(1):65-71. PMID: 12816772 (ADA).

Erkkilä AT, Lichtenstein AH, Mozaffarian D, Herrington DM. [Fish intake is associated with a reduced progression of coronary artery atherosclerosis in postmenopausal women with coronary artery disease.](#) Am J Clin Nutr. 2004 Sep;80(3):626-32. PMID: 15321802 (ADA).

Erkkilä AT, Matthan NR, Herrington DM, Lichtenstein AH. [Higher plasma docosahexaenoic acid is associated with reduced progression of coronary atherosclerosis in women with CAD.](#) J Lipid Res. 2006 Dec;47(12):2814-9. Epub 2006 Sep 18. PMID: 16983146 (ADA).

Plant n-3 fatty acids question:

What is the relationship between consumption of Plant n-3 fatty acids and risk of cardiovascular disease?

Albert CM, Oh K, Whang W, Manson JE, Chae CU, Stampfer MJ, Willett WC, Hu FB. [Dietary alpha-linolenic acid intake and risk of sudden cardiac death and coronary heart disease.](#) Circulation. 2005 Nov 22;112(21):3232-8. PMID: 16301356 (ADA).

de Lorgeril M, Salen P, Martin JL, Monjaud I, Delaye J, Mamelle N. [Mediterranean diet, traditional risk factors, and the rate of cardiovascular complications after myocardial infarction: final report of the Lyon Diet Heart Study.](#) Circulation. 1999 Feb 16;99(6):779-85. PMID: 9989963. (ADA).

Folsom AR, Demissie Z. [Fish intake, marine omega-3 fatty acids, and mortality in a cohort of postmenopausal women.](#) Am J Epidemiol. 2004 Nov 15;160(10):1005-10. PMID: 15522857

Lemaitre RN, King IB, Sotoodehnia N, Rea TD, Raghunathan TE, Rice KM, Lumley TS, Knopp RH, Cobb LA, Copass MK, Siscovick DS. [Red blood cell membrane alpha-linolenic acid and the risk of sudden cardiac arrest.](#) Metabolism. 2009 Apr;58(4):534-40. PMID: 19303975.

Lemaitre RN, King IB, Mozaffarian D, Kuller LH, Tracy RP, Siscovick DS. [n-3 Polyunsaturated fatty acids, fatal ischemic heart disease, and nonfatal myocardial infarction in older adults: the Cardiovascular Health Study.](#) Am J Clin Nutr. 2003 Feb; 77 (2): 319-325. PubMed ID: 12540389 (ADA).

Mozaffarian D, Ascherio A, Hu FB, Stampfer MJ, Willett WC, Siscovick DS, Rimm EB. [Interplay between different polyunsaturated fatty acids and risk of coronary heart disease in men.](#) Circulation. 2005 Jan 18;111(2):157-64. Epub 2005 Jan 3. PMID: 15630029

Rastogi T, Reddy KS, Vaz M, Spiegelman D, Prabhakaran D, Willett WC, Stampfer MJ, Ascherio A. [Diet and risk of ischemic heart disease in India.](#) Am J Clin Nutr. 2004 Apr; 79(4): 582-592. PMID: 15051601.

Virtanen JK, Mursu J, Voutilainen S, Tuomainen TP. [Serum long-chain n-3 polyunsaturated fatty acids and risk of hospital diagnosis of atrial fibrillation in men.](#) Circulation. 2009 Dec 8;120(23):2315-21. Epub 2009 Nov 23. PMID: 19933935

List of Excluded Articles with Reason

Articles	Reasons for Exclusion
Aarsetoey H, Pönitz V, Grundt H, Staines H, Harris WS, Nilsen DW. <u>(n-3) Fatty acid content of red blood cells does not predict risk of future cardiovascular events following an acute coronary syndrome.</u> J Nutr. 2009 Mar;139(3):507-13. Epub 2009 Jan 21. PMID: 19158216.	Measures omega-3 index of admitted ACS patients No intervention. Cross sectional Study.
Astorg P, Bertrais S, Laporte F, Arnault N, Estaquio C, Galan P, Favier A, Hercberg S. <u>Plasma n-6 and n-3 polyunsaturated fatty acids as biomarkers of their dietary intakes: a cross-sectional study within a cohort of middle-aged French men and women.</u> Eur J Clin Nutr. 2008 Oct;62(10):1155-61. Epub 2007 Jul 11. PMID: 17622261.	Cross Sectional Study. Uses plasma fatty acid concentrations as marker to dietary n-3 fatty acids determined by FFQ.
Barceló-Coblijn G, Murphy EJ, Othman R, Moghadamian MH, Kashour T, Friel JK. <u>Flaxseed oil and fish-oil capsule consumption alters human red blood cell n-3 fatty acid composition: a multiple-dosing trial comparing 2 sources of n-3 fatty acid.</u> Am J Clin Nutr. 2008 Sep;88 (3):801-9. PMID: 18779299.	Intervention provided as capsules
Baylin A, Kabagambe EK, Ascherio A, Spiegelman D, Campos H. <u>Adipose tissue alpha-linolenic acid and nonfatal acute myocardial infarction in Costa Rica.</u> Circulation. 2003 Apr; 107(12): 1, 586-1, 591.	No dietary intervention.
Beydoun MA, Kaufman JS, Sloane PD, Heiss G, Ibrahim J. <u>n-3 Fatty acids, hypertension and risk of cognitive decline among older adults in the Atherosclerosis Risk in Communities (ARIC) study.</u> Public Health Nutr. 2008 Jan;11(1):17-29. Epub 2007 Jul 12. PMID: 17625029.	Outcomes measured involved inhibition of cognitive decline in hypertension
Bloedon LT, Balikai S, Chittams J, Cunnane SC, Berlin JA, Rader DJ, Szapary PO. <u>Flaxseed and cardiovascular risk factors: results from a double blind, randomized, controlled clinical trial.</u> J Am Coll Nutr. 2008 Feb;27(1):65-74. PMID: 18460483.	Intervention provided as capsules
Cazzola R, Russo-Volpe S, Miles EA, Rees D, Banerjee T, Roynette CE, Wells SJ, Goua M, Wahle KW, Calder PC, Cestaro B. <u>Age- and dose-dependent effects of an eicosapentaenoic acid-rich oil on cardiovascular risk factors in healthy male subjects.</u> Atherosclerosis. 2007 Jul;193(1):159-67. Epub 2006 Aug 1. PMID: 16879829	Intervention provided as capsules
Chilton FH, Rudel LL, Parks JS, Arm JP, Seeds MC. <u>Mechanisms by which botanical lipids affect inflammatory disorders.</u> Am J Clin Nutr. 2008 Feb;87(2):498S-503S. Review. PMID: 18258646.	Narrative review
Chung H, Nettleton JA, Lemaitre RN, Barr RG, Tsai MY, Tracy RP, Siscovick DS. <u>Frequency and type of seafood consumed influence plasma (n-3) fatty acid concentrations.</u> J Nutr. 2008 Dec;138(12):2422-7. PMID: 19022967.	Studies frequency, processing and type of fish consumption on plasma fatty acids.
Chrysohoou C, Panagiotakos DB, Pitsavos C, Skoumas J, Kritis X, Chloptsiotis Y, Nikolaou V, Stefanadis C. Long-term fish consumption is associated with protection against arrhythmia in healthy persons in a Mediterranean region--the ATTICA study. Am J Clin Nutr. 2007 May;85(5):1385-91. PMID: 17490977.	Intermediate outcome, not CVD event s
Damsgaard CT, Frøkiaer H, Andersen AD, Lauritzen L. <u>Fish oil in combination with high or low intakes of linoleic acid lowers plasma triacylglycerols but does not affect other cardiovascular risk markers in healthy men.</u> J Nutr. 2008 Jun;138(6):1061	Intermediate outcomes, not CVD event
Damsgaard CT, Frøkiaer H, Lauritzen L. <u>The effects of fish oil and high or low linoleic acid intake on fatty acid composition of human peripheral blood mononuclear cells.</u> Br J Nutr. 2008 Jan;99(1):147-54. Epub 2007 Jul 30. PMID: 17663804.	Reported outcomes limited to FA composition of mononuclear cells
DeGiorgio CM, Miller P, Meymandi S, Gornbein JA. <u>n-3 fatty acids (fish oil) for epilepsy, cardiac risk factors, and risk of SUDEP: clues from a pilot, double-blind, exploratory study.</u> Epilepsy Behav. 2008 Nov;13(4):681-4. Epub 2008 Sep 7. PMID: 18721899.	Intervention provided as capsules
Delgado-Lista J, Lopez-Miranda J, Cortés B, Perez-Martinez P, Lozano A, Gomez-Luna R, Gomez P, Gomez MJ, Criado J, Fuentes F, Perez-Jimenez F. <u>Chronic dietary fat intake modifies the postprandial response of hemostatic markers to a single fatty test meal.</u> Am J Clin Nutr. 2008 Feb;87(2):317-22. PMID: 18258620	Intervention does not meet criteria. Single test meal.
De Lorgeril M, Salen P, Martin JL, Monjaud I, Delaye J, Mamelle N. Mediterranean Diet, traditional risk factors, and the rate of cardiovascular complications after myocardial infarction, final report of the Lyon Diet Heart Study. Circulation. 1999; 99: 779-785. PubMed ID:9989963.	Intervention provided as dietary advice
Din JN, Harding SA, Valerio CJ, Sarma J, Lyall K, Riemersma RA, Newby DE, Flapan AD. <u>Dietary intervention with oil rich fish reduces platelet-monocyte aggregation in man.</u> Atherosclerosis. 2008 Mar;197(1):290-6. Epub 2007 Jun 18. PMID: 17575985.	Intermediate outcome not CVD event s
Dioussé L, Rautaharju PM, Hopkins PN, Whitsel EA, Arnett DK, Eckfeldt JH, Province MA, Ellison RC; Investigators of the NHLBI Family Heart Study. <u>Dietary linolenic acid</u>	Intermediate outcome Qtrr measurments, not CVD events

and adjusted QI and JI intervals in the National Heart, Lung, and Blood Institute Family Heart study. <i>J Am Coll Cardiol.</i> 2005 May 17;45(10):1716-22. PMID: 15893192.	
Dodin S, Cunnane SC, Mâsse B, Lemay A, Jacques H, Asselin G, Tremblay-Mercier J, Marc I, Lamarche B, Légaré F, Forest JC. Flaxseed on cardiovascular disease markers in healthy menopausal women: a randomized, double-blind, placebo-controlled trial. <i>Nutrition.</i> 2008 Jan;24(1):23-30. Epub 2007 Nov 5. PMID: 17981439.	Intermediate outcomes, not CVD event
Ebbesson SO, Roman MJ, Devereux RB, Kaufman D, Fabsitz RR, Maccluer JW, Dyke B, Laston S, Wenger CR, Comuzzie AG, Romenesko T, Ebbesson LO, Nobmann ED, Howard BV. Consumption of omega-3 fatty acids is not associated with a reduction in carotid atherosclerosis: the Genetics of Coronary Artery Disease in Alaska Natives study. <i>Atherosclerosis.</i> 2008 Aug;199(2):346-53. Epub 2007 Dec 4. PMID: 18054937.	Intermediate outcome not CVD event
Egert S, Kannenberg F, Somoza V, Erbersdobler HF, Wahrburg U. Dietary alpha-linolenic acid, EPA, and DHA have differential effects on LDL fatty acid composition but similar effects on serum lipid profiles in normolipidemic humans. <i>J Nutr.</i> 2009 May;139(5):861-8. Epub 2009 Mar 4. PMID: 19261730.	Intermediate outcome Qtrr measurments, not CVD events
Fekete K, Marosvölgyi T, Jakobik V, Decsi T. Methods of assessment of n-3 long-chain polyunsaturated fatty acid status in humans: a systematic review. <i>Am J Clin Nutr.</i> 2009 Jun;89(6):2070S-2084S. Epub 2009 May 6. PMID: 19420097.	Study involves Markers of n-3 LCPUFA. Does not address question
Freund-Levi Y, Hjorth E, Lindberg C, Cederholm T, Faxen-Irving G, Vedin I, Palmblad J, Wahlund LO, Schultzberg M, Basun H, Eriksdotter Jönsson M. Effects of omega-3 fatty acids on inflammatory markers in cerebrospinal fluid and plasma in Alzheimer's disease: the OmegaAD study. <i>Dement Geriatr Cogn Disord.</i> 2009;27(5):481-90. Epub 2009 May 12. PMID: 19439966.	Intervention provided as capsules
Fuentes F, López-Miranda J, Pérez-Martínez P, Jiménez Y, Marín C, Gómez P, Fernández JM, Caballero J, Delgado-Lista J, Pérez-Jiménez F. Chronic effects of a high-fat diet enriched with virgin olive oil and a low-fat diet enriched with alpha-linolenic acid on postprandial endothelial function in healthy men. <i>Br J Nutr.</i> 2008 Jul;100(1):159-65. Epub 2008 Feb 14. PMID: 18275619.	Intermediate outcomes, not CVD event
Galli C, Risé P. Fish consumption, omega 3 fatty acids and cardiovascular disease. The science and the clinical trials. <i>Nutr Health.</i> 2009;20(1):11-20. PMID: 19326716.	Narrative Review
Gissi-HF Investigators, Tavazzi L, Maggioni AP, Marchioli R, Barlera S, Franzosi MG, Latini R, Lucci D, Nicolosi GL, Porcu M, Tognoni G. Effect of n-3 polyunsaturated fatty acids in patients with chronic heart failure (the GISSI-HF trial): a randomised, double-blind, placebo-controlled trial. <i>Lancet.</i> 2008 Oct 4;372(9645):1223-30. Epub 2008 Aug 29. PMID: 18757090..	Subjects had chronic heart failure.
Goyens PL, Mensink RP. Effects of alpha-linolenic acid versus those of EPA/DHA on cardiovascular risk markers in healthy elderly subjects. <i>Eur J Clin Nutr.</i> 2006 Aug;60(8):978-84. Epub 2006 Feb 15. PMID: 16482073	Intermediate outcome Qtrr measurments, not CVD events
Guebre-Egziabher F, Rabasa-Lhoret R, Bonnet F, Bastard JP, Desage M, Skilton MR, Vidal H, Laville M. Nutritional intervention to reduce the n-6/n-3 fatty acid ratio increases adiponectin concentration and fatty acid oxidation in healthy subjects. <i>Eur J Clin Nutr.</i> 2008 Nov;62(11):1287-93. Epub 2007 Aug 15. PMID: 17700650.	Study involves n-3/n-6 ratio. Not variables that address the question.
Harris WS. The omega-3 index as a risk factor for coronary heart disease. <i>Am J Clin Nutr.</i> 2008 Jun;87(6):1997S-2002S. PMID: 18541601.	Narrative review
Hartweg J, Perera R, Montori V, Dinneen S, Neil HA, Farmer A. Omega-3 polyunsaturated fatty acids (PUFA) for type 2 diabetes mellitus. <i>Cochrane Database Syst Rev.</i> 2008 Jan 23;(1):CD003205. Review. PMID: 18254017	Reviewed outcomes did not distinguish supplements from dietary
He K, Liu K, Daviglus ML, Jenny NS, Mayer-Davis E, Jiang R, Steffen L, Siscovick D, Tsai M, Herrington D. Associations of dietary long-chain n-3 polyunsaturated fatty acids and fish with biomarkers of inflammation and endothelial activation (from the Multi-Ethnic Study of Atherosclerosis [MESA]). <i>Am J Cardiol.</i> 2009 May 1;103(9):1238-43. Epub 2009 Mar 4. PMID: 19406265.	Intermediate outcome not CVD events
He K, Liu K, Daviglus ML, Mayer-Davis E, Jenny NS, Jiang R, Ouyang P, Steffen LM, Siscovick D, Wu C, Barr RG, Tsai M, Burke GL. Intakes of long-chain n-3 polyunsaturated fatty acids and fish in relation to measurements of subclinical atherosclerosis. <i>Am J Clin Nutr.</i> 2008 Oct;88(4):1111-8. PMID: 18842801.	Intermediate outcome not CVD events
Hoyos C, Almqvist C, Garden F, Xuan W, Oddy WH, Marks GB, Webb KL. Effect of omega 3 and omega 6 fatty acid intakes from diet and supplements on plasma fatty acid levels in the first 3 years of life. <i>Asia Pac J Clin Nutr.</i> 2008;17(4):552-7. PMID: 19114389.	Reported outcomes limited to FA composition of plasma based on diet

